

CLAIMS

1. A method for cleaning a semiconductor wafer, comprising:
plasma etching a feature into a low K dielectric layer having a photoresist mask,
the plasma etching generating etch residues;
5 ashing the semiconductor wafer to remove the photoresist mask, the ashing
generating ashing residues; and
removing the etching residues and the ashing residues from the low K dielectric
layer, the removing being enhanced by scrubbing the low K dielectric layer of the
semiconductor wafer with a wet brush that applies a fluid mixture including a cleaning
10 chemistry and a wetting agent.
2. A method for cleaning a semiconductor wafer as recited in claim 1,
wherein the wetting agent is a surfactant and the cleaning chemistry includes a
combination of NH_4OH , H_2O_2 , and deionized (DI) water.
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3. A method for cleaning a semiconductor wafer as recited in claim 2,
wherein the surfactant is selected from a group comprising fluorosurfactants and
hydrocarbon surfactants.
- 20 4. A method for cleaning a semiconductor wafer as recited in claim 3,
wherein the surfactant has a concentration between about 0.005 percent by weight to
about 0.1 percent by weight.

5. A method for cleaning a semiconductor wafer as recited in claim 3,
wherein the surfactant has a concentration of about 0.01 percent by weight.

6. A method for cleaning a semiconductor wafer as recited in claim 2,
5 wherein the combination ratio of NH_4OH , H_2O_2 , and DI water is between about 1:4:10
and about 1:4:30.

7. A method for cleaning a semiconductor wafer as recited in claim 6,
wherein the combination ratio of NH_4OH , H_2O_2 , and DI water is about 1:4:20.

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8. A method for cleaning a semiconductor wafer as recited in claim 1, further
comprising:

scrubbing the low K dielectric layer using the brush while applying deionized (DI)
water after removing the etching residues and the ashing residues.

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9. A method for cleaning a semiconductor wafer, comprising:

plasma etching a feature into a low K dielectric layer having, the plasma etching
generating etch residues in and around the feature;

subjecting the semiconductor wafer to an ashing operation, the ashing operation
20 generating ashing residues; and

scrubbing the low K dielectric layer using a mixture fluid including a cleaning
chemistry and a wetting agent, the wetting agent being configured to condition the low K
dielectric layer to facilitate cleaning of the etch residues and the ashing residues with the
cleaning chemistry.

10. A method for cleaning a semiconductor wafer as recited in claim 9, further comprising:

scrubbing the low K dielectric layer using the brush while applying deionized (DI) water after removing the etching residues and the ashing residues.

11. A method for cleaning a semiconductor wafer as recited in claim 9, wherein the wetting agent is a surfactant and the cleaning chemistry includes a combination of NH_4OH , H_2O_2 , and deionized (DI) water.

12. A method for cleaning a semiconductor wafer as recited in claim 11, wherein the surfactant is selected from a group comprising fluorinated surfactants and hydrocarbon surfactants.

13. A method for cleaning a semiconductor wafer as recited in claim 11, wherein the surfactant has a concentration between about 0.005 percent by weight to about 0.1 percent by weight.

14. A method for cleaning a semiconductor wafer as recited in claim 11, wherein the surfactant has a concentration of about 0.01 percent by weight.

15. A method for cleaning a semiconductor wafer as recited in claim 11, wherein the combination ratio of NH_4OH , H_2O_2 , and DI water is between about 1:4:10 and about 1:4:30.

16. A method for cleaning a semiconductor wafer as recited in claim 11,
wherein the combination ratio of NH_4OH , H_2O_2 , and DI water is about 1:4:20.

5 \ 17. A method for cleaning a semiconductor wafer, comprising:

plasma etching a feature into a low K dielectric layer having, the plasma etching
generating etch residues in and around the feature;

subjecting the semiconductor wafer to an ashing operation, the ashing operation
generating ashing residues; and

10 scrubbing the low K dielectric layer using a mixture fluid including a cleaning
chemistry and a wetting agent, the wetting agent being configured to condition the low K
dielectric layer to facilitate cleaning of the etch residues and the ashing residues with the
cleaning chemistry; and

15 scrubbing the low K dielectric layer using the brush while applying deionized (DI)
water after removing the etching residues and the ashing residues.

18. A method for cleaning a semiconductor wafer as recited in claim 17,
wherein the wetting agent is a surfactant and the cleaning chemistry includes a
combination of NH_4OH , H_2O_2 , and deionized (DI) water.

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19. A method for cleaning a semiconductor wafer as recited in claim 17,
wherein the surfactant is selected from a group comprising fluorinated surfactants and
hydrocarbon surfactants.

20. A method for cleaning a semiconductor wafer as recited in claim 18, wherein the surfactant has a concentration between about 0.005 percent by weight to about 0.1 percent by weight.

5 21. A method for cleaning a semiconductor wafer as recited in claim 18, wherein the surfactant has a concentration of about 0.01 percent by weight.

22. A method for cleaning a semiconductor wafer as recited in claim 18, wherein the combination ratio of NH_4OH , H_2O_2 , and DI water is between about 1:4:10
10 and about 1:4:30.

23. A method for cleaning a semiconductor wafer as recited in claim 18, wherein the combination ratio of NH_4OH , H_2O_2 , and DI water is about 1:4:20.

15 24. A method for cleaning a semiconductor wafer, comprising:
plasma etching a feature into a low K dielectric layer having, the plasma etching generating etch residues in and around the feature;
subjecting the semiconductor wafer to an ashing operation, the ashing operation generating ashing residues; and
20 scrubbing the low K dielectric layer using a mixture fluid including a cleaning chemistry and a wetting agent, the wetting agent being configured to condition the low K dielectric layer to facilitate cleaning of the etch residues and the ashing residues with the cleaning chemistry, the wetting agent being a surfactant and the cleaning chemistry being a standard clean-1 (SC-1) solution including a combination of NH_4OH , H_2O_2 , and

deionized (DI) water, the surfactant having a concentration between about 0.005 percent by weight to about 0.1 percent by weight, combination ratio of NH_4OH , H_2O_2 , and DI water being between about 1:4:10 and about 1:4:30; and

- scrubbing the low K dielectric layer using the brush while applying deionized (DI)
- 5 water after removing the etching residues and the ashing residues.

FIG. 10 is a schematic diagram of a substrate 1000.

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